Acupuncture: New and Old Concept for Healthcare

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What is Acupuncture

• is one of the key components of traditional Chinese medicine (TCM)

• is a family of procedures to stimulate points on the body (acupoints)—most commonly is the insertion of thin, solid metallic needles.

• is intended to remove blockages in the flow of energy ("Qi"), restore and maintain health

• is with thousands of years’ history
Types of Acupuncture

- Classical acupuncture
- Electroacupuncture
- Laser acupuncture
- Cupping
- Acupuncture injection
- Moxibustion
Acupuncture: A New Concept for Healthcare in US

Current health care: “mainstream” medicine—Conventional or Western Medicine

- **Prevention**: vaccination, isolation... no acupuncture
- **Diagnosis**: Not use TCM method
- **Treatment**: Not include as a routine method
- **Healing**: Not include as a routine method
- **Insurance**: No cover for prevention, no cover for acupuncture
Acupuncture: An old Concept for HealthCare in the East
How Old Is Acupuncture?

“Bian” Stone and Bone needles

New Stone Age 5000BC
Acupuncture: An old Concept

Ancient Needles

Modern Needles

Gold needle

Silver needle

Han Dynasty, 200BC-220AD
Acupuncture: An old Concept for HealthCare in the East

• Acupuncture is a key component of traditional Chinese medicine (TCM)
• TCM had been a main healthcare system for thousands of years before western medicine introduced

• Prevention: Diet, herbal remedies, qigong, acupuncture, TuiNa...
• Diagnosis: Use all TCM methods: yin-yang, tongue, pulse, Meridian, five elements...
• Treatment: Acupuncture, moxibustion, herbal remedies, TuiNa, Diet, qigong ...
• Healing: All TCM modalities including acupuncture
• Insurance: Cover All TCM modalities including acupuncture
What Is Traditional Chinese Medicine (TCM)

A whole medical system that originated in China. It is based on the concept that disease results from disruption in the flow of qi and imbalance in the forces of yin and yang. Practices including acupuncture, herbs, meditation, massage, and diet seek to aid healing by restoring the yin-yang balance and the flow of qi. --NCCAM

• A medical system with 3,000+ year’s history for prevention, diagnosis, treatment and rehabilitation of illness
• Holistic perception of mind, body, health and diseases
• Unique terminology and medical theories
• Individualized (personalized) medicine
• Comprehensive plan for healthcare
Comparison of East & West

East
- Empirical Observations over Thousands of Years
- Art of Medicine
- Holistic View
- Circular Logic
- Energetic

West
- Scientific Method & Case-Based Medicine
- Technology of Medicine
- Molecular and Organ View
- Linear Logic
- Mechanistic
Modalities of TCM

- Acupuncture, moxibustion and cupping
- Chinese Materia Medica and Prescription:
  1. Botanical Sources - Herbology
     (root, stem, bark, leaf, flower, fruit and seeds)
  2. Zoological sources
     (antilope/buffalo horn, chicken gizzard membrane, musk, turtle shell, oyster shell etc.)
  3. Mineral - (Gypsum, mirabilite, borneol, cinnabar, etc.)
- Tui Na/Body manipulation (massage, acupressure, corrective manipulation)
- Qigong/Tai’Chi
- Diet/nutrition
Traditional Chinese Medicine

Alimentotherapy
Basic Principles of TCM

- Ying-Yang
- Qi, Xue (blood), Jing (Essence), Ye (body fluid)
- Zang-Fu (Internal Organ)
- Maridian (Channel)
- Five element
Yin - Yang

The Tao is the One,
From the One come Yin and Yang;
From these two, creative energy;
From energy, ten thousand things;
The forms of all creation.

All life embodies the yin
And embraces the yang,
Through their union
Achieving harmony.

--Tao Te Ching, C42
Yin-Yang

- Concept describing how things function in relation to each other and to the universe
- Complementary opposites as parts of whole

Yin-Yang balance

Yin-Yang imbalance

Yin-Yang relationship:
- Opposition
- Interdependence
- Mutual consumption
- Inter-transformation
**Application of Yin-Yang**

<table>
<thead>
<tr>
<th></th>
<th>YIN</th>
<th>YANG</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Structure of human body</strong></td>
<td>front, interior</td>
<td>back, exterior</td>
</tr>
<tr>
<td><strong>Physiology</strong></td>
<td>structure</td>
<td>function</td>
</tr>
<tr>
<td><strong>Pathology</strong></td>
<td>hypo-function</td>
<td>hyper-function</td>
</tr>
<tr>
<td><strong>Diagnosis</strong></td>
<td>exterior, heat, excess</td>
<td>interior, cold, deficiency</td>
</tr>
<tr>
<td><strong>Chinese medicine</strong></td>
<td>cold/cool, sour, salty, bitter</td>
<td>hot/warm, pungent, sweet</td>
</tr>
<tr>
<td><strong>Treatment</strong></td>
<td>replenish Yin/Yang deficiency, reducing excessive heat or fire with cold drug; treating excessive cold with warm drug</td>
<td></td>
</tr>
</tbody>
</table>
Application of Yin-Yang

Eat balanced
Application of Yin-Yang

Keep fit physically and mentally

Yang

Yin
Brain Yin-Yang

Yin Chemicals
- GABA
- Glycine
- 5-HT
- DA
- Endorphin
- Estrogen
- Melatonin
- ...

Yang Chemicals
- Glutamate
- NE
- Ach
- Adenosine
- Testosterone

Stress
- Nicotine

Sleep/memory Yin-Yang
- Balanced
- Imbalanced

Normal:
- Attention
- Memory
- Mood
- Neurogenesis

Abnormal:
- Attention deficit
- Memory deficit
- Depression/Anxiety
- Neurodegeneration
- Decreased Neurogenesis
- Oxidative stress
Qi (Chi 气)

Qi --life energy, moving force (Yang)

*Types of Qi:*
- **Origin:** Yuan Qi (prenatal-parents), Zong Qi (postnatal-breathing), Ying Qi (nourishing Qi-food), Wei Qi (defending Qi-food)
- **Structure:** Zang-Fu Qi (Qi of internal organ), Meridian Qi

*Function of Qi:* Promoting, defending, warming, consolidating and governing, “Qi Hua” (metabolizing and transforming)
Meridian Systems--Pathways for “Qi” Flow & Links of All Systems

- 14 regular meridians
- All acupoints distribute along meridians
- Bridge in and out of the body
- Reflect pathophysiology of the inside.
- Guide the treatment

Lung meridian--yin
LI meridian--yang
Meridians

Where there is no free flow (blockage), there is pain.
Meridians

Where there is free flow, there is no pain.

Pathogenic factors

No free flow (blockage)

Pain

Meridian

Acupuncture Stimulation

Eliminating

Normal

Meridian
**Zang-Fu (脏腑) -- Internal Organs**

Functional systems, not pure anatomical ones

<table>
<thead>
<tr>
<th>Five Zang (Yin organs)</th>
<th>Six Fu (Yang organs)</th>
<th>Extraordinary Organs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liver (Gan)</td>
<td>Gallbladder</td>
<td>Brian</td>
</tr>
<tr>
<td>Heart (Xin)</td>
<td>Small intestine</td>
<td>Medulla</td>
</tr>
<tr>
<td>Spleen (Pi)</td>
<td>Stomach</td>
<td>Bone</td>
</tr>
<tr>
<td>Lungs (Fei)</td>
<td>Large intestine</td>
<td>Vessel</td>
</tr>
<tr>
<td>Kidneys (Shen)</td>
<td>Bladder</td>
<td>Gallbladder</td>
</tr>
<tr>
<td></td>
<td>Three warmers</td>
<td>Uterus</td>
</tr>
</tbody>
</table>

*Mind-body connection*
Heart (心): The monarch of all organs

- Controls blood and vessels
- Houses mind and governs mental activity
- Controls sweat
- Opens into tongue
- Manifests in complexion
Kidneys (肾): Root of life, Root of Yuan Qi

• Store Essence and govern birth, growth, reproduction and development
• Produce marrow, fill up brain and control bones
• Govern water
• Control reception of Qi
• House Will power,
• Open into ears and manifest in hair
Liver (肝): The general of organs from whom the strategy is derived

- Stores blood,
- Ensures smooth flow of Qi and blood
- Houses Ethereal Soul
- **Regulating mind and mood**
- Promoting digestion and absorption
- Controls sinew
- Opens into eyes
- Manifests in nails.
Peak time for each organ

Breakfast
Five Elements

Anger/Anxiety

- Insomnia
- Poor appetite
- Short breath
- Urination disorder
## Five Elements

<table>
<thead>
<tr>
<th></th>
<th>Wood</th>
<th>Fire</th>
<th>Earth</th>
<th>Metal</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Yin Organ</strong></td>
<td>Liver</td>
<td>Heart</td>
<td>Spleen</td>
<td>Lung</td>
<td>Kidney</td>
</tr>
<tr>
<td><strong>Yang Organ</strong></td>
<td>Gall Bladder</td>
<td>Small Intestine</td>
<td>Stomach</td>
<td>Large Intestine</td>
<td>Bladder</td>
</tr>
<tr>
<td><strong>Emotions</strong></td>
<td>Anger</td>
<td>Joy</td>
<td>Pensiveness</td>
<td>Grief</td>
<td>Fear</td>
</tr>
<tr>
<td><strong>Taste</strong></td>
<td>Sour</td>
<td>Bitter</td>
<td>Sweet</td>
<td>Pungent</td>
<td>Salty</td>
</tr>
<tr>
<td><strong>Season</strong></td>
<td>Spring</td>
<td>Summer</td>
<td>Late Summer</td>
<td>Autumn</td>
<td>Winter</td>
</tr>
</tbody>
</table>
Acupuncture: What Conditions Commonly Treated

- Health maintenance and promotion
- Prevention—boost immune function, anti-aging, anti-oxidation...
- Complement to western medicine
- Therapeutic—
  -- Chronic pain (headaches, joints, back, neck, sciatica, TGN, TMJ, arthritis pain...)
  -- Emotional/mental conditions (stress, anxiety, depression, insomnia)
  -- PMS, dysmenorrhea; menopausal syndromes; fertility
  -- GI dysfunction
  -- Cardiovascular conditions
  -- Respiratory ailment (sinus allergy, asthma)
  -- Immunological/endocrinological conditions
- Others—sport injury, military use, cosmetic
WHO: recognizes acupuncture's common use in treating over 100 conditions.

**Acupuncture:** review and analysis of reports on controlled clinical trials

*(WHO: http://www.who.int/iris/handle/10665/42414, 2002)*
<table>
<thead>
<tr>
<th>Completed</th>
<th>Efficacy of Acupuncture in the Treatment of Fibromyalgia</th>
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<tbody>
<tr>
<td></td>
<td>Condition: Fibromyalgia</td>
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<tr>
<td></td>
<td>Intervention: Procedure: Acupuncture</td>
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<tr>
<td></td>
<td>Funder Type: NIH</td>
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<tr>
<td></td>
<td>Study Completion: July 2002</td>
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<td></td>
<td>First Received: February 2, 2001</td>
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</table>

<table>
<thead>
<tr>
<th>Completed</th>
<th>Acupuncture in the Treatment of Depression</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Conditions: Depressive Disorders; Depression</td>
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<tr>
<td></td>
<td>Intervention: Procedure: Acupuncture</td>
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<tr>
<td></td>
<td>Funder Type: NIH</td>
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<td>Study Completion: April 2002</td>
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<td>First Received: February 2, 2001</td>
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<table>
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<tr>
<th>Completed</th>
<th>Randomized Controlled Trial of Acupuncture for Dysmenorrhea</th>
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<tr>
<td></td>
<td>Condition: Dysmenorrhea</td>
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<tr>
<td></td>
<td>Interventions: Procedure: acupuncture; Procedure: usual care</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recruiting</th>
<th>Acupuncture for the Treatment of Insomnia</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Condition: Primary Insomnia</td>
</tr>
<tr>
<td></td>
<td>Intervention: Other: Acupuncture</td>
</tr>
<tr>
<td></td>
<td>Funder Type: Other / NIH</td>
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<tr>
<td></td>
<td>Study Completion: February 2013</td>
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<tr>
<td></td>
<td>First Received: March 2, 2009</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Recruiting</th>
<th>Acupuncture in Menopause</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Condition: Vasomotor Symptoms</td>
</tr>
<tr>
<td></td>
<td>Intervention: Procedure: Acupuncture</td>
</tr>
<tr>
<td></td>
<td>Funder Type: Other / NIH</td>
</tr>
<tr>
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<td>Study Completion:</td>
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<tr>
<td></td>
<td>First Received:</td>
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<tr>
<th>Recruiting</th>
<th>Brain Mechanisms of Acupuncture Treatment in Chronic Low Back Pain</th>
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<tr>
<td></td>
<td>Conditions: Chronic Low Back Pain; Low Back Pain; Back Pain</td>
</tr>
<tr>
<td></td>
<td>Intervention: Procedure: Acupuncture</td>
</tr>
<tr>
<td></td>
<td>Funder Type: Other / NIH</td>
</tr>
<tr>
<td></td>
<td>Study Completion: December 2016</td>
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<td></td>
<td>First Received: May 8, 2012</td>
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</table>
## Insomnia

### Patterns:

<table>
<thead>
<tr>
<th>YIN</th>
<th>YANG</th>
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<tr>
<td>Heart/Spleen deficiency</td>
<td>Liver-qí stagnation</td>
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### Symptoms:

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<td>Excessive dream, hard to stay asleep, fatigue, poor memory, dizziness, pale tongue with thin coating, fine and weak pulse</td>
<td>Excessive dream, hard to fall asleep, irritation, bitter taste, headache, impatience, red tongue with yellow coating, string-pulse</td>
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### Treatment:

<table>
<thead>
<tr>
<th>YIN</th>
<th>YANG</th>
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<tbody>
<tr>
<td>Replenish heart and spleen</td>
<td>Promote liver qi</td>
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### Patterns:

<table>
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<th>Yin deficiency</th>
<th>Liver-fire</th>
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<th>Liver-fire</th>
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<td>Excessive dream, hard to stay asleep, fatigue, poor memory, dizziness, red tongue, weak thin pulse</td>
<td>Excessive dream, hard to fall asleep, irritation, bitter taste, headache, impatience, thin/yellow coating, rapid string-like pulse</td>
</tr>
</tbody>
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### Treatment:

<table>
<thead>
<tr>
<th>Yin deficiency</th>
<th>Liver-fire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replenish Yin</td>
<td>Clear up liver fire</td>
</tr>
</tbody>
</table>
How Does Acupuncture Work?

From TCM perspective:

- Unblock meridian
- Enhance “Qi”
- Modulate “Zang-Fu”
- Optimize “In” and “out”
- Balance “Yin-Yang”

From biomedical perspective:

- Improve local condition
- Regulate nervous system
- Modulate neurotransmission
- Enhance immune function
- Regulate endocrine activity
- And more...
Overview of Acupuncture Action

--Peripheral Nervous system

- **A-delta fibers** - smaller, fast transmitting, myelinated fibers that transmit sharp pain
  - Mechanoreceptors - Triggered by strong mechanical pressure and intense temperature

- **C-fibers** - smallest, slow transmitting unmyelinated nerve fibers that transmit dull or aching pain.
  - Mechanoreceptors - Mechanical & Thermal
  - Chemoreceptors - Triggered by chemicals released during inflammation

- **A-alpha/beta fibers** - large diameter, fast transmitting, myelinated sensory fibers

<table>
<thead>
<tr>
<th>Axon Type</th>
<th>Aα</th>
<th>Aβ</th>
<th>Aδ</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter (µm)</td>
<td>13-20</td>
<td>6-12</td>
<td>1.5</td>
<td>.2-1.5</td>
</tr>
<tr>
<td>Speed (m/s)</td>
<td>80-120</td>
<td>35-75</td>
<td>5.35</td>
<td>.5-2.0</td>
</tr>
</tbody>
</table>
Overview of Acupuncture Action -- Central Nervous system
Overview of Acupuncture Action -- Central Nervous System

Thalamus:
- The sensory switchboard of the brain
- Located in the middle of the brain

Somatosensory Cortex:
- Receives all info on touch and pain
- Somatotopically organized
Overview of Acupuncture Action

Yin Yang

Adapted from Benarroch 2008

Glands
- Heart & vessels
- Lungs
- Liver
- Kidney/bladder
- GI

Acupuncture

Yin Yang

Anterior cingulate gyrus

Periaqueductal gray

Dopamine
Norepinephrine
Serotonin
Endorphin

Rostral ventromedial medulla

Dorsal horn
At the tip of a needle—local improvement

Connective tissue stretches by physical extension (1) or acupuncture (2)

- Fibroblasts enlarged & flattened

- Rho signaling (3)

- ATP release

Change cell shape
Analgesic effect 4)

Cell focal adhesion
Remodeling (5)

Connective tissue relaxation

Langevin HM, 2013
Acupuncture modulation on HPO/HPA axis

Acupuncture modulation on HPA axis

Zhu CB, 2013

Spinal Cord

Acupuncture
A-β & δ fibers
Neuroendocrine modulation of blood pressure by acupuncture

Zhou and Longhurst 2012
Acupuncture modulation on affective disorder via immune system and central 5HT, NE and DA

Immunological Stress (viral, bacterial, chemical..)

IL-10 → IL-1R

p38 MAPK/ERK

Midbrain SERT, NET and DAT

Altered 5HT-NE-DA homeostasis

Increased risk for affective disorders

Zhu CB, 2011
Acupuncture and Pain
Gate Control Theory
Proposed by Melzack and Wall in the 1960's
Acupuncture and Pain

**Gate Control Theory**
Proposed by Melzack and Wall in the 1960's

- Pain nerves. Activity opens the gate
- Other sensory nerves. Activity closes the gate (e.g., rubbing the affected area)
- Messages from the brain
- Messages to the brain
- Transmission nerve cells

Acupuncture closes the gate
# Conditions that open or close the gate

<table>
<thead>
<tr>
<th></th>
<th>Conditions that open the gate</th>
<th>Conditions that close the gate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical conditions</strong></td>
<td>Extent of the injury</td>
<td>Medication</td>
</tr>
<tr>
<td></td>
<td>Inappropriate activity level</td>
<td>Counter stimulation, eg Acupuncture, massage</td>
</tr>
<tr>
<td><strong>Emotional Conditions</strong></td>
<td>Anxiety or worry</td>
<td>Positive emotions</td>
</tr>
<tr>
<td></td>
<td>Tension</td>
<td>Relaxation</td>
</tr>
<tr>
<td></td>
<td>Depression</td>
<td>Rest</td>
</tr>
<tr>
<td><strong>Mental conditions</strong></td>
<td>Focusing on the pain</td>
<td>Intense concentration or distraction (meditation)</td>
</tr>
<tr>
<td></td>
<td>Boredom</td>
<td>Involvement and interest in life activities</td>
</tr>
</tbody>
</table>
Acupuncture and Pain

Molecules involved:

- endogenous opioid
- CCK
- 5-HT
- DA
- NE
- IL-1
- GABA

...
Acupuncture and Pain

Opioidergic Mechanisms for Analgesic Effect of Acupuncture

Diagram showing frequency of electrical stimulation, opioid peptides, opioid receptors, interaction, and physiological effects.
Acupuncture and Pain

Acupuncture up-regulates opioid receptor

![Image showing saline and acupuncture effects on forebrain and diencephalon](Zhu CB, 1995)
Acupuncture Analgesia

- **Enkephalins & Dynorphins** Spinal Cord (Substantia Gelatinosa)
- **Endorphins** Brainstem (Periaqueductal Gray Matter)
- **5HT** Brainstem (Raphe Nuclei)
Acupuncture and Pain

Effect of Acupuncture on Brain Neurotransmitters

Neurotransmitters in hippocampus

Zhu CB, 1995
Activation: information processing and control centers—supramarginal gyrus (language center), SII, pre-supplementary motor area (pre-SMA), middle cingulate gyrus, insula, thalamus, precentral gyrus

Deactivation: limbic system—amygdala, hippocampus, vmPFC, posterior cingulate cortex (PCC).

Huang et al. 2012
Imaging Studies on Acupuncture

“Deqi” deactivation of brain

Imaging Studies on Acupuncture

**Activation on Deqi**

**Deactivation on Deqi**

*MacPherson et al. 2006*
Imaging Studies on Acupuncture “Deqi” deactivation of brain

Acupoint (Liv3)

Hui KS, Napadow V, Kwong K et al. 2010, JOVE
Monitoring Acupuncture Effects on Human Brain by fMRI
Imaging Studies on Acupuncture
carpal tunnel syndrome (CTS) treated by acupuncture

Healthy control
Napadow, V, et al., Neuroimaging, 2005

CTS: Baseline

CTS: Post-Acupuncture

Human Brain Mapping; 28:159-131, 2006
Summary on how acupuncture works

Adapted from Benarroch 2008
Stresses

Infection/Irritation/Injuries…

Inflammation

Inflammatory cytokines (IL-1, IL-6, TNF-α, CRP…)

“Mess up” CNS

“Switch on” oncogenes

“Chew up” Nerve cells

Affective disorders

Depression
OCD
PTSD
Cognitive impairment

Increase cholesterol

Heart Disease
High BP
Stroke

Insulin resistance

Loss of bone minerals

Diabetes

Osteoporosis

Acupuncture

Increase cholesterol

Heart Disease
High BP
Stroke

Cancer

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Affective disorders

Depression
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Cognitive impairment
Acupuncture:
Keep Brain Yin-Yang Balanced

Keep free flow of energy
Keep body healthy
Keep life quality

Yin Chemicals
- GABA
- Glycine
- 5-HT
- DA
- Endorphin
- Estrogen
- Melatonin
- ...

Yang Chemicals
- Glutamate
- NE
- Ach
- Adenosine
- Testosterone